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Globalization of Finance and Fintech in The MENA Region

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GLOBALIZATION OF FINANCE AND FINTECH IN THE MENA REGION[1]

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Abstract

Globalization, together with Fintech – in other words, the application of technology to finance – are in the process of revolutionizing the financial services industry. This paper looks at this process in the MENA region and focuses on two sets of countries. The first set comprises the high-income countries of Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the UAE. The second group consists of the middle-income countries of Algeria, Egypt, Iraq, Jordan, Lebanon, Morocco, and Tunisia. Countries can benefit from fintech to differing degrees in terms of the financial inclusion of both households and firms, especially small- and medium-sized enterprises (SMEs). Advances in credit scoring, digital banking, and peer-to-peer lending have the potential to transform banking if properly implemented. Distributed ledger, blockchain, and cryptocurrency technologies have enabled Initial Coin Offerings (ICOs). These can greatly improve the number of start-ups and their subsequent growth. They also enable Central Bank Digital Currencies (CBDCs) that may significantly improve central banks' effectiveness of intervening in the financial system and economy. Finally, appropriate cybersecurity and financial regulation are needed to ensure that fintech can achieve these improvements. Policymakers should be accommodative towards fintech innovations to obtain their full potential benefit.

Keywords: Globalization, Fintech, Technology, Finance, MENA region

JEL Classifications: O3, O4

1. Introduction

There is considerable evidence that finance plays an important role in economic growth, employment, and the alleviation of poverty (for a survey, see Allen, Gu, and Kowalewski, 2018). Senbet (2019) discusses these issues in the context of the Middle East and North Africa (MENA) region. This paper focuses on two recent and important developments regarding the change in financial structure for the region: the globalization of finance and fintech. The former refers to the reduction in barriers, which has allowed finance to flow more freely between countries. The latter, on the other hand, is the use of modern technologies, often computer-based, to support or enable banking and financial services. The two are closely related as many fintech activities are conducted on the Internet and hence are global in nature.

One of the striking features of the MENA region is the range of countries that it contains in terms of GDP per capita in purchasing power parity (PPP) terms. At one end is Yemen, which has one of the lowest incomes per capita in the world, while at the other end is Qatar, which has one of the highest. In between, there is a large range. Some of the MENA countries are difficult to assess because of conflict (Syria, Libya, Palestine, Yemen) or limited information (Mauritania, Somalia, Sudan, Eritrea), and so will be excluded from this paper. It is helpful to divide the remaining countries into two groups according to their GDP per capita in PPP terms in 2019 as shown in Table 1.

- **Group 1** are the high-income countries: Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the UAE;
- **Group 2** are the middle-income countries: Algeria, Egypt, Iraq, Jordan, Lebanon, Morocco, and Tunisia.

Those in Group 1 constitute the Gulf Cooperation Council (GCC) countries and are among the richest in the world. Those in Group 2 are middle-income countries. Algeria and Iraq are oil producers while the remainder are not. These two countries potentially have better access to global capital markets due to their oil production. The needs from the globalization of finance for these groups are often different. By and large, the Group 1 countries are investors in other countries through sovereign wealth funds and other vehicles. The Group 2 countries, on the other hand, require funds to develop. The level of infrastructure for fintech is also significantly different, with the populations of the Group 1 countries enjoying ready access to the Internet using mobile phones and computers. In the Group 2 countries, only part of the population has Internet access.

Section 2 will briefly consider the nature of the economies in the region, the different structures of their financial systems, their position in a world with global finance, and the infrastructure that is available to support fintech. Section 3 considers fintech and financial inclusion for

countries in Group 2. Advances in Kenya, in particular M-Pesa's development of mobile telephone payments and Equity Bank's dramatic increase of financial inclusion through the sophisticated use of computers, show how even less developed countries can benefit significantly from fintech.

All the countries in the region have primarily bank-based financial systems. This means that both groups of countries can benefit from the advances in credit scoring, digital banking, and marketplace lending that modern techniques of artificial intelligence (AI) and machine learning (ML) allow. These topics are discussed in Section 4.

Section 5 explains Distributed Ledger Technologies (DLTs), blockchains, and cryptocurrencies. These technologies form the foundation of the developments in the next two sections. Meanwhile, section 6 considers Initial Coin Offerings (ICOs) that are based on cryptocurrencies and represent a novel way of tapping into global capital markets for the financing of innovative companies. The countries in Group 1 can potentially benefit significantly from this advance. Countries in Group 2 may also be able to grow their economies if entrepreneurs have sufficient access to the Internet and so are able to tap into the global markets that ICOs potentially allow.

There is a wide range of views on the importance of cryptocurrencies in countries' financial systems going forward. A number of central banks have considered whether or not to introduce central bank digital currencies and these are discussed in Section 7. This is, again, particularly relevant for Group 1 countries.

The rise of fintech has underlined the importance of cybersecurity, which is the topic of Section 8. This is important for both groups of countries. A good example is the breach of the defences of the central bank in Bangladesh, which resulted in the loss of a large amount of money.

The way in which fintech will develop is, to a large extent, determined by the form of regulation countries take, and this is covered in Section 9. This is relevant for all the countries and political economy factors are key in this regard. Finally, Section 10 concludes.

The paper draws on a number of recent digitalization reports from UN agencies as well as Allen, Jagtiani, and Xu (2021), who survey the literature on fintech.

2. MENA financial systems and infrastructure for fintech

Arezki and Senbet (2020) point out that the financial systems of the countries in the MENA region are overwhelmingly bank-based. They argue that the reason for this is the large role played by governments in their economies. Typically, there are two types of firms in these countries. The first are large firms, often state-owned or politically connected, that have access to banks. The second, on the other hand, are small- and medium-sized enterprises (SMEs) that

cannot raise funds easily; they do not have good access to the banks, and informal finance and retained earnings are their main source of funds.

Financial markets, such as stock markets and various forms of bond markets, do exist in some countries but are still at an early stage. The listing of Saudi Aramco in the Saudi Arabian stock market in December 2019 gave stock markets in the region a significant boost as it was the most valuable company in the world at the time.

Arezki and Senbet's (2020) findings are confirmed in columns three through seven in Table 1. In Group 1 countries, bank deposits to GDP are mostly high and the same is true for bank credit to bank deposits. Oman and Saudi Arabia are slight outliers as the amount of deposits is lower and the bank credit relative to deposits is higher than for the other Group 1 countries. While the stock market capitalization to GDP numbers are mostly high, the total value traded is mostly low, suggesting that the stock market is not that important. Saudi Arabia is, again, an exception. The results for the 2020 World Bank Ease of Doing Business rankings are high for the UAE, but for the other countries they are disappointing given their GDP per capita. Since fintech, by and large, relies less on traditional institutions than banks and stock markets, this suggests that it will have a relative advantage in these countries, other things equal.

For the Group 2 countries, the data in Table 1 indicate that banks are significantly more important than stock markets. The latter are even less important than in Group 1 countries. Ease of doing business rankings are very poor and this suggests that fintech will have some advantages.

Many countries block currency convertibility and have strict capital controls. This limits prospects for Foreign Direct Investment (FDI) and the ability of firms, even large ones, to borrow on the international capital markets. As this paper will show, fintech potentially provides a way to overcome some of the difficulties these impediments create.

UN (2019a) documents a number of important aspects about the infrastructure needed for fintech in the countries in Groups 1 and 2:

(i) Mobile telephony is reasonably advanced in most MENA nations, including many of those that are quite poor. Mobile phone penetration rates are between 70 percent to 200 percent while mobile coverage rates are between 80 percent to 100 percent.

(ii) Internet access is close to 100 percent in the Group 1 countries and is between 45 percent and 80 percent in Group 2 countries.

(iii) E-banking is doing well in the Group 1 countries, but financial services have less than average use and the affordability of the Internet is rather low in the Group 2 countries.

Lukonga (2018) provides an interesting analysis of the landscape of fintech in MENA countries. The payment system has dominated initial fintech innovations, but the effect of these

is still relatively limited. Crowdfunding lending is the second largest fintech segment, but the contribution is also small. The particular developments the paper documents are mentioned where relevant below.

As the impetus for climate change grows around the world, the demand for fossil fuels is likely to fall. This has already happened with coal; much of the world's coal reserves are already viewed as "stranded" assets that will never be used. Most of the countries in Group 1 – and Algeria and Iraq from Group 2 – currently depend on oil and gas revenues. As oil and gas are gradually phased out, developing alternative industries that can provide employment and support the countries' economies points to the importance of banks and financial markets in these countries. It is often argued that venture capital and stock markets play an important role in this process (see, for example, Allen and Gale, 1999 and 2000). In addition, with the emergence of fintech, ICOs potentially provide another effective way of financing new firms and industries.

3. Fintech and financial inclusion

Financial inclusion, typically defined as the use of formal financial services, especially by the disadvantaged, is a subject of growing importance. This is a particular problem in Group 2 countries where many people do not have access to simple financial services such as bank accounts and borrowing. The positive relationship between financial development and economic development, documented by the literature on the finance-growth nexus, underlines this (for example, see Levine, 1997 and Demirgüç–Kunt, Detragiache, and Gupta, 2013). Sahay et al. (2020) develop a new index of digital financial inclusion and show that financial inclusion is increasing, while providing evidence that this is associated with higher growth in GDP and lower inequality. There is also evidence that fintech appears to be closing gender gaps in financial inclusion. This is important as Chen et al. (2021) have found a large gender gap.

Section 3.1 considers how fintech has radically changed access to financial services for individuals in a number of countries. These provide an important model for services that can be implemented in the Group 2 countries so that their degree of financial inclusion is improved. It is not just financial inclusion for individuals that is important, but also financial inclusion for SMEs. Ensuring that these firms have access to finance is also critical for the ability of the Group 2 countries to grow. This is considered in Section 3.2.

3.1. Providing financial services to unbanked individuals

What are important factors that determine the level of financial access? Beck, Demirguc-Kunt, and Levine (2007) show that the overall level of economic development, the quality of the institutional environment, the degree of credit information sharing, the level of initial endowments, and the development of physical infrastructure are positively associated with financial outreach and depth. Moreover, the cost of enforcing contracts and the degree of government ownership of banks are negatively associated with financial outreach and depth. Allen et al. (2016) explore the factors underpinning financial inclusion; they find that policies

to promote financial inclusion are especially effective among the most commonly excluded groups of individuals from access to finance: the poor, those living in rural areas, females, and young individuals.

Fintech can promote financial inclusion in different ways. Kenya is a particularly interesting country in this regard due to two major innovations there. The first is M-PESA (for example, see Mas and Radcliffe, 2011). This was developed by Vodafone and launched in Kenya by its affiliate Safaricom in 2007. It is a system for payments and storage of value using basic mobile phones. The way it works is that registered customers are assigned an e-money account linked to their mobile phone number. This allows them to deposit and withdraw money at a network of retail shops. They can also transfer money to other users and make a wide range of payments. The fees for these services are low. M-PESA was very successful from the start and 68 percent of Kenya's adult population had accounts within four years.

The second example is Equity Bank, which has made significant strides in financial inclusion. The emergence of the bank, a pioneering and private institution that devised a banking service targeting low-income and less-educated customers and underserved regions, is documented in Allen et al. (2021). They examine bank branch penetration and financial access in the sector and show that Equity Bank has had a positive and significant impact on households' use of bank accounts and credit access in Kenya. Its presence increased the financial inclusion of the adult population by 31 percent between 2006 and 2015. The number of deposit and loan accounts of Equity Bank represented around 50 percent and 30 percent of the total number of deposit and loan accounts in Kenya, respectively. Their findings suggest that the successful business model of Equity Bank in Kenya provides an example of a solution to the financial access problem that has hindered real growth in many countries.

Both M-PESA and Equity Bank represent a good model for the countries in Group 2.

3.2. Providing financial services to SMEs

There is evidence that SMEs that are denied credit by banks are often able to obtain it subsequently from fintech platforms. This holds true for a wide range of countries and so is relevant for countries in Groups 1 and 2. For example, Schweitzer and Barkley (2017) examine the characteristics of online small business borrowers in the US using the Federal Reserve's 2015 Small Business Credit Survey data and find supportive results that businesses denied access to credit by banks turned to fintech lenders to arrange credit for their business. Consistent findings have been documented by other studies such as Ahmed et al. (2016). They find that borrowers were unable to secure external financing without an online fintech lending platform, despite being creditworthy. Other interesting examples more relevant for Group 2 countries are from China. Hau, Huang, Shan, and Shen (2019a, b) use a comprehensive loan data set from Alibaba's online lending e-commerce platform to show that fintech credit promotes financial inclusion in China. Fintech helps mitigate local credit supply frictions in the credit market and extend the "frontier" of credit availability to small businesses with low

credit scores. In addition, these online e-commerce platforms have promoted a self-selection process in which more funding tends to be channelled to those online merchants that receive better rating by their customers (see Huang, Li, and Shan, 2019). Thus, fintech provides the possibility to increase financial inclusion for SMEs in countries in both groups. More details of lending platforms and other fintech innovations that can help in the provision of credit to SMEs will follow.

4. Credit scoring and big tech, digital banking, and peer-to-peer lending

This section discusses recent enhanced systems for credit scoring using AI/ML and alternative data from Big Tech, digital banking and investment services, and the role of marketplace lending and peer-to-peer (P2P) lending. These are particularly important for Group 1 countries. Going forward, there is a scope for using them in less prosperous countries such as those in Group 2. The example of M-PESA shows that, even in emerging economies, significant amounts of data can be generated, and Equity Bank shows that computers can be very successful in bringing down financial intermediation costs. Big Tech and its ability to generate data is making inroads into finance in Africa and the Middle East. Cornelli et al. (2020) find that Big Tech and fintech are roughly equally important in Kenya (see the right-hand panels in Graphs 1 and 3). The Bank for International Settlements (2019) provides information on the role of Big Tech in Africa and the Middle East (right-hand panel of Graph 1 for the African and Middle Eastern share in big tech subsidiaries).

4.1. Credit scoring and Big Tech

Credit scores have served as the primary factors in credit decisions for many years. Research that compares traditional default prediction models with more advanced techniques using AI/ML along with non-traditional data from Big Tech firms and other sources suggests that there can be significant increases in predictive ability that reduce default. Soft information about borrowers, such as information on friendship and social networks, online footprints, and text-based analysis, can be very helpful in improving credit allocation decisions.

Iyer, Khwaja, Luttmer, and Shue (2016) use data from a lending platform. They investigate the following basic proxies for soft information: whether the borrower posts a picture, the number of words used in the listing text descriptions, friend endorsements, and so forth. Their findings suggest that, while traditional information such as credit score, requested loan amount, and current delinquencies are important in credit decisions, this alternative data can play an important role in credit risk evaluation and allow credit access for borrowers who are less creditworthy by traditional measures.

Consistent with these findings, Berg et al. (2020) analyze the information content of borrowers' digital footprints, such as activities people do online. The proprietary data set from an e-commerce company includes a basic set of variables, such as whether their email contains their real name, whether they make purchases at night time, and the number of typing mistakes, all of which are found to be important. Their empirical investigations suggest that even the simple,

easily accessible variables from the digital footprint could be valuable for consumers' default prediction. Overall, their study shows that the digital footprint variables complement standard traditional information from consumer credit bureaus.

Fintech giants Alibaba and WeChat Pay Points Credit by Tencent in China have built new credit scoring systems based on alternative data they collect from non-traditional sources, including social media, online shopping, payment applications, and cell phone accounts. This type of scoring provides a more comprehensive view of consumers' financial lives and helps fill the credit gap for people who cannot get a loan because of their lack of credit history. Gambacorta et al. (2019) consider how ML and non-traditional data affect credit scoring using evidence from a Chinese fintech firm. The feedback effect of the data that Big Techs are able to gather and how it enables them to grant credit on advantageous terms gives rise to important competition issues. These are discussed in Ehlers et al. (2021).

Another important question in credit decisions is the price of credit. Jagtiani and Lemieux (2019) use loan-level data from a personal lending platform and compare interest rates charged with the interest rate borrowers would have to pay by carrying a credit card balance. They find that the use of alternative data has allowed some consumers with poor credit scores to receive credit at a much lower cost.

4.2. Digital banking

Recent retail banking services innovations primarily rely on technological advances such as faster Internet access, which has spurred the adoption of online banking and improved payment processes. The determinants of the adoption of Internet-based banking are well documented in the literature. The relation between fintech start-ups and banks is also important for the development of Internet banking. These issues are, again, primarily relevant to the Group I countries where access to the Internet is good, but are also relevant for a part of the banking sector in Group 2 countries since a significant portion of their population has Internet access.

The determinants of the adoption of Internet-based banking has been well documented in the literature. Furst, Lang, and Nolle (2002) use a cross-section sample of banks in 1999 and show that important factors that determine a bank's decision to adopt new internet technologies for online banking services are those that are more profitable, have a larger asset size, have presence in urban markets, and are a subsidiary of a bank holding company (BHC). Hernandez-Murillo, Llobet, and Fuentes (2010) confirm that, in addition to bank characteristics (branching intensity, capital-to-asset ratio, nonperforming loan ratio, being subsidiary of a BHC), bank customers' demographic factors (household income, education, Internet access) are also important determinants of online banking adoption. Similar findings have been documented by Kowalewski and Pisany (2020) using cross-country data.

Klus, Lohwasser, Hornuf, and Schwienbacher (2020) investigate the drivers and the extent to which banks interact with fintech start-ups, using detailed information on strategic alliances

made by the 100 largest banks in Canada, France, Germany, and the UK. They find that larger banks are better able to integrate start-ups into their own business model and strategy than smaller banks. They also find significantly positive market reactions in response to announcements of alliance formations between digital banks and fintech firms.

4.3. P2P lending

P2P lending platforms have emerged as an appealing new channel of financing for consumers and small businesses over the last decade. They are designed to match lenders and borrowers and to eliminate the intermediary middleman. These are most relevant for Group 1 countries. Given the lack of competition in many of these countries' banking systems, they potentially provide an important competitive force.

The platforms work by connecting investors (funding supply) and borrowers (funding demand) directly to facilitate the transaction and reduce the costs of intermediation. There is evidence showing that new traditional bank loans are trending downward, while new P2P lending is trending upward. This raises a natural question as to whether these two types of lenders are complements or substitutes in the credit market. Balyuk (2018) explores the effect of P2P lending on consumers' access to credit and finds that fintech lenders have improved credit access to consumers who cannot access credit from traditional banks. Similarly, Jagtiani and Lemieux (2018) find that fintech lenders have penetrated areas that may be underserved by traditional banks, such as in highly concentrated markets and areas that have fewer bank branches per capita. Other studies, such as de Roure, Pellizon, and Thakor (2018), show that P2P lending can substitute or complement bank lending, depending on the situation. For example, if banks experience an exogenous regulatory shock, P2P lending can act as a substitute for bank lending to inframarginal borrowers, but in regards to small-scale loans, P2P lending is more likely to complement bank lending.

There is also the issue of whether P2P lending platforms can price loans efficiently. Two mechanisms for pricing are used; the first is an auction and the second, more common approach, is posted prices. An auction process typically relies on the relative strength of lenders and borrowers to determine the price; whereas posted prices are predetermined by complex algorithms used by the lending platforms. Wei and Lin (2017) show that under posted prices, borrowers are more likely to obtain credit, but the default probability is also higher. Franks, Serrano-Velarde, and Sussman (2018) use a peer-to-business (P2B) lending platform and find that the auction mechanism is not effective. A one percent increase in the interest rate corresponds to a less than an 0.5 percent increase in the default probability, implying that information efficiency was not reached in the pricing process.

5. Distributed ledger technology, blockchains, and cryptocurrencies

Two fintech developments that are very important for MENA countries are ICOs and Central Bank Digital Currencies (CBDCs). These are particularly important at the moment for Group 1 countries but in the longer run also have great potential for the countries in Group 2. This

section discusses the technological advances that have made these possible, namely Distributed Ledger Technology (DLT), blockchain, and cryptocurrencies, the most well-known of which is bitcoin.

DLT is a term widely used to describe various record-keeping technologies, such as decentralized data architecture and cryptography, which allow for keeping and sharing records in a synchronized way while ensuring their integrity through the use of consensus-based validation protocols. Blockchain is typically used in conjunction with DLT, containing blocks of records that are linked using cryptography. Each block contains a cryptographic hash of the previous block, a timestamp, and transaction data. By design, a blockchain is intended to be resistant to data modification. However, there have been concerns around cybersecurity related to blockchain. In general, blockchain is designed to be an open, distributed ledger that can record transactions between two parties efficiently and in a verifiable and permanent way. Blockchain has become a buzzword; mainly because it is the main technology underlying bitcoin transactions. Since late 2015, blockchains in general (not bitcoin blockchains) have attracted explosive interest from the fintech industry as a new way to create, exchange, and track ownership of financial assets on P2P platforms. Blockchain technology has also facilitated the creation of smart contracts; these are computerized protocols allowing terms contingent on decentralized consensus that are tamper proof and self-enforcing via automated execution (see Szabo, 1994 and Cong and He, 2018).

The idea of blockchain was initially introduced by Haber and Stornetta (1991) to authenticate authorship of intellectual property. Much later, Nakamoto (2008) reintroduced it as a method of validating ownership of the cryptocurrency bitcoin. It is viewed as a potentially mainstream financial technology of the future to eliminate a trusted third party in financial intermediation. Szabo (2005) proposes a similar idea to overcome the problem of dependence on a trusted third party. The proposed “bit gold” was a protocol whereby costly bits could be created online (with minimal dependence on trusted third parties) and then securely stored, transferred, and assayed with similar minimal trust. The creation of such bit gold would be based on various functions including “client puzzle function,” “proof of work function,” or “secure benchmark function.”

There are three main types of blockchain. The first type, a private blockchain, comes originally from the chain proposed by Haber and Stornetta (1991). In this chain, there needs to be an entity with authority, identified as a sponsor or gatekeeper, taking complete control over what is written on the ledger. Such sponsors or gatekeepers can restrict entry into a market, access monopolistic user fees, edit incoming data, or limit users’ access to market data. The second type, a permissioned blockchain, is one in which the write privilege is granted to a consortium of entities. These entities govern the policies of the blockchain and take control of propagating and verifying transactions. The third type is a public blockchain, in which the write privilege is completely unrestricted. Because the writers are allowed to be anonymous in the public blockchain, there needs to be an efficient, fair, and real-time mechanism to ensure that all participants agree on a consensus on the status of the ledger.

So far, well-known types of consensus mechanism algorithms include: (1) proof of work (POW), which is used by major cryptocurrency networks such as Bitcoin and Litecoin; and (2) proof of stake (POS), which is used by Peercoin. The POW requires a participant node to prove that it has accomplished a computationally difficult task before getting the rights to write on the ledger. Therefore, one disadvantage of POW is that it needs high-energy consumption and longer processing time. The POS emerges and evolves as a low-cost and low-energy consuming alternative to the POW algorithm, attributing mining power to the proportion of coins held by each miner. Auer (2019) contains an interesting analysis of the disadvantages of the POW system.

Bitcoin, which is perhaps the best known cryptocurrency, was designed to allow anonymous transactions outside the reach of governments. Although not very practical as a means of transacting, it has been a successful investment for many people – although it is often criticized as being subject to bubbles. Its price rose from a few cents a coin after it came into existence in 2009 to around USD 200 at the start of 2015. In December 2017, it reached a peak of around USD 19,500 before falling back to just over USD 2,300 in December 2018. It then started a significant rise to a peak of USD 56,000 in February 2021.[2] How its price will evolve going forward is very uncertain.

Lukonga (2018) points out that the trading and mining of cryptocurrencies is widespread in the MENA countries, while cryptocurrency exchanges have emerged in Bahrain, Egypt, and the UAE. Many countries have warned about the risks of cryptocurrencies, but the UAE is the only country that introduced regulations to govern their trading.

As mentioned at the beginning of the section, it is the technologies that bitcoin has pioneered that are a major part of its contribution to fintech. We turn next to two of these that are particularly relevant for the MENA countries.

6. ICOs

One of the most important roles of the financial system in both Group 1 and Group 2 countries is to provide finance for new firms. These are important for growth and providing jobs, particularly for young people. In general, banks do not do a good job in financing start-ups. The most successful mechanism for funding new firms in the last few decades has been initial financing by Angels and Venture Capitalists. Successful firms are usually sold in one of two ways: the first is to have them undergo an Initial Public Offering (IPO) and then list them on a stock market. The second alternative is to sell them to a larger company seeking to take advantage of the technology or business that the start-up has developed. ICOs are a very interesting alternative that have the potential to finance start-ups in Group 1 countries in the short run and Group 2 countries in the long run.

[2] See https://finance.yahoo.com/quote/BTC-USD/.

ICOs are mechanisms to raise funds by selling coins or tokens, using blockchain technology, to support a product launch or a new virtual currency (for example, see Allen, 2020). ICOs are a conjunction of crowdfunding and blockchain. Tokens purchased in an ICO give the participant certain rights, most frequently the right to use the platform services that are being developed, or ownership rights. The coins can also be exchanged for other cryptocurrencies (and fiat currencies) on cryptocurrency exchanges. They operate similarly to IPOs but typically skirt the usual regulations and restrictions on IPOs. This is achieved by doing everything on the Internet. While start-ups have traditionally relied on venture capital to raise funds and grow, ICOs are more decentralized. The total capital raised through ICOs was only USD 16 million across two deals in 2014, but this grew rapidly in the following years and in 2018 there were 1,253 issues raising USD 7.812 billion.

Since ICOs are unregulated in many countries, they are done in a number of ways. A typical sequence of events is as follows:

1. The promoters making the ICO issue a "white paper." These take on many different forms but usually describe the nature and uses of the technology being funded.
2. Possible investors can then ask the promoters questions about the technology and the business that is being founded.
3. An initial sale of coins is made, and the promoters use the funds to implement the project. The promoters keep a portion of the coins so that they have an incentive to complete the project, in which case the coins will have value.
4. Coins can be used on the platform to buy and sell the product the firm produces. These transactions are recorded on a blockchain.
5. The coins can be bought and sold for conventional currencies on cryptocurrency exchanges.

Cohney et al. (2019) compare the information released in ICOs and the protection of investors through computer code or what are known as "smart contracts" with traditional legal mechanisms in IPOs. They consider the top 50 ICOs in terms of funds raised in 2017 and collect the white papers and other available information. Their focus is on three issues regarding promises made in the documentation and whether they were coded in the smart contracts: (1) Did the promoters promise to restrict coin supply? (2) Was the vesting of coins to promoters to provide incentives as promised? (3) Did promoters retain the right to modify the code and was this disclosed?

The authors found that the ICO code and ICO disclosures often do not match. The code often fails to deliver key investor protections such as limiting the number of coins and providing the incentives to complete the project as promised. Also, the code often allows the promoters considerable ability to change the terms of engagement in ways that were not disclosed. Overall, the degree of protection is considerably less than in IPOs.

Kaal (2018) points to several advantages of ICOs compared to conventional ways of raising capital:

1. ICOs enable borderless online sales with very few costs by enabling promoters to bypass the usual legal and jurisdictional hurdles by directly selling to a worldwide pool of investors.
2. They provide excellent liquidity because global cryptocurrency exchanges provide continuous access to trading ICO tokens from the early stages of the business.
3. ICOs provide liquidity to investors faster than other forms of capital formation. For example, venture capital funds can capitalize on existing profits early while avoiding long and complex processes leading up to an IPO or sale.

The main disadvantage of ICOs is the lack of regulatory oversight and legal recourse to the promoters as discussed in Cohney et al. (2019).

An example of an ICO that illustrates some of its main features is Streamr,[3] a platform designed to allow agents to buy and sell continuous streams of data for various applications. For instance, an asset manager might want to buy data on stock market prices, macroeconomic variables, and so on, to drive its asset allocation model. Sellers of this data will find Streamr a useful platform to connect with such buyers.

The ICO raised 30 million Swiss Francs. The coins that were issued are called DATAcoins. There are a fixed number of DATAcoins and they are not mined, but can be earned by selling data, or they can be bought or sold at a cryptocurrency exchange.[4]

There is wide range of ways in which the regulation of ICOs works in different countries:

- In China and South Korea, there is an outright ban.
- In the US, the Securities and Exchange Commission (SEC) released a Report of Investigation in July 2017 that found that a blockchain-based token qualified as a security requiring registration under the Securities Act of 1933.
- Many regulatory authorities issue a warning concerning the risks of investing in ICOs including the US, Singapore, Hong Kong, UK, Australia, Germany, and the European Union's European Securities and Markets Authority (ESMA).

In order to take advantage of the opportunities that ICOs create for economies in terms of growth and job creation, it is very important that regulators in MENA countries do not over-regulate them. There are consumer protection issues as many ICOs turn out to be scams, but the overall average returns from investing in ICOs are significantly positive (see Allen, 2020). However, the liquidity provided by ICOs and the global nature of the fundraising make these

[3] Full details of the firm can be found at https://token.streamr.com/

[4] The following link gives access to a page with details of the current price of DATAcoins and various other information such as the total market capitalization of the company. https://coinmarketcap.com/currencies/streamr-datacoin/.

a very powerful financing tool for transforming economies. They have great potential for Group 1 countries now. Lukonga (2018) points out that a few fintech companies issued ICOs but the number is limited. As experience is gained, particularly in emerging economies, their fundraising from global markets means they have significant potential for Group 2 countries as well.

7. CBDCs

Private sector cryptocurrencies like bitcoin have caused some consternation in the central bank community because of the threat they pose to their control of monetary policy, particularly in advanced countries like those in Group 1. One of the main issues is the problem posed for financial stability because of the volatility of private cryptocurrency prices if they become widely used. These threats from private cryptocurrencies have led to intensive debates among policymakers and monetary economists about whether and how central banks play a role in CBDCs and whether to issue the CBDC or play a supporting role in issuing CBDCs. Based on a BIS survey of central banks, with 63 central bank respondents representing jurisdictions covering close to 80 percent of the world population, Barontini and Holden (2019) show that many central banks are progressing from conceptual work on CBDCs into experimentation and proofs-of-concept, including cooperating with other central banks. Auer, Cornelli, and Frost (2020) provide a summary of the issues involved in implementing CBDCs and highlight several important country experiences with CBDCs. Issuing CBDCs is likely to become increasingly common among central banks, including the MENA region, and particularly in the Group 1 countries.

One of the most advanced countries in terms of implementing a CBDC is China. Kynge and Yu (2021) outline their plans to run city-level trials in 2021 and 2022 so that the e-yuan is ready for use by the 2022 Beijing Winter Olympic Games. The way that pilots have so far operated is that users withdraw e-yuan via state-bank ATM machines into their smartphones' e-wallets. They pay for goods by holding their smartphone app close to an e-yuan point-of-sale device. Since the e-yuan will be legal tender, all merchants will be required to have equipment to enable these transactions in the long run.

Currently, Alibaba subsidiary Ant Group's Alipay and Tencent's WeChat provide a very large proportion of the payments that are made in China's financial system. The introduction of the e-yuan will create a strong competitor for Alipay and WeChat and significantly change the structure of the payments system. One example of the advantage of the e-yuan is that it will be possible to conduct offline transactions, so access to the Internet is not crucial.

The other important aspect of China's CBDC is the role it can play in helping the yuan to challenge the dollar as the main international reserve and trade currency. In January 2021, China agreed to form a joint venture with SWIFT, the Belgium-based global system for cross-border payments. Ultimately, China would like to have more trade denominated in yuan. For the oil-producing GCC countries in Group 1, China is a very important customer and

incorporating its e-currency into their international financial operations is likely to become increasingly important. Introducing their own CBDC may be helpful in this regard.

Lukonga (2018) suggests that there has been some interest in MENA countries in issuing national digital currencies encrypted on blockchain. The UAE and Saudi Arabia have considered a bilateral cross-border digital currency and Lebanon has expressed interest in a national digital currency.

8. Cybersecurity

Cybersecurity is becoming increasingly important for all firms. However, it is particularly important for financial services firms. Fintech firms are severely at risk because what they do is innovative and the risks are unclear. There are many examples of cybersecurity breaches in the financial services industry and firms must constantly be on guard.

Recent surveys by PricewaterhouseCoopers (PwC) from 2017 to 2019 show that more than half of CEOs expect cybersecurity and data breach incidents to threaten stakeholder trust in their industries in the near future. On top of that, the financial industry has witnessed the most incidents with data losses. While advanced financial technology brings efficiency gains for financial institutions and improves financial inclusion, it has also increased the sophistication of the attack, making it harder and more complex to prevent. The increased cyber-risks because of the advanced financial technology can take on multiple forms, including cyber-risks related to the data-sharing process, such as data aggregation through an open API. This allows third-party vendors to access consumer data directly from their bank account. There has been increased vulnerability, especially when the interfaces between the two systems are not compatible (for example, not designed around the same time period by different developers and often because of limitations of banks' legacy technology). It is increasingly difficult to thoroughly identify all potential sources of vulnerability in the systems as the processes are usually more time-consuming and expensive.

The various financial applications that allow consumers to transfer funds and make payments through voice or facial recognition also increase cyber-risk; for example, Amazon Alexa, CapOne, and the Bank of America's ERICA app. There have been several incidences of successful cyberattacks, including an incident in February 2016 when hackers stole USD 81 million from the Central Bank of Bangladesh through transfer fraud via compromised SWIFT servers. The SEC's EDGAR system was also hacked by a Ukrainian hacker using deceptive hacking techniques in 2016. The extracted EDGAR files that contained non-public earnings information was passed on to individuals who used it to trade in the narrow window before the companies released the news to the public, resulting in at least USD 4.1 million of illegal profits.

Another well-known cyber incident is the Equifax hack in September 2017, in which hackers exploited a vulnerability in the software that Equifax uses to build its websites to steal customer names, social security numbers, birthdates, and addresses, affecting 147.7 million Americans.

Later in July 2019, the Amazon Alexa and CapOne data breach exposed credit card application data for those who applied between 2005 and 2019, affecting roughly 100 million individuals in the US and six million customers in Canada. Many cryptocurrency exchanges have also been shut down because hackers were able to steal assets from the exchange systems. Finally, cloud computing, which is an enabler of the fintech ecosystem (payment gateways, digital wallets, and secured online payments rely on cloud-computing services) also resulted in new types of risk, especially cyber-risks.

While the direct costs related to cyber incidents (such as the cost of forensic investigation, legal assistance, customer notification and post-breach customer protection, and other measures) can be relatively well understood, the indirect costs (such as the reputation risks of brand names, negative shock to existing customer relationships, or depreciation of intellectual property value), on the other hand, are far less visible, more long term, and more difficult to quantify. Therefore, there can be significant uncertainty surrounding the potential impact of cyber incidents, as documented in Kopp, Kaffenberger, and Wilson (2017).

Conventional wisdom suggests that hacking events would have some negative influence on firms' reputations and, henceforth, on growth prospects. Recent studies confirm this prediction and find that a firm's stock price drops upon the announcement of a serious cybersecurity breach. For example, Lin et al. (2019) show that there is an abnormal return of -1.44 percent in the five-day window surrounding the public announcement of a data breach, and such price declines do not reverse over the following month. Amir, Levi, and Livne (2018) document that firms may underreport the cyberattacks and investors cannot discover most attacks independently. For the withheld attacks, the negative abnormal return in the stock market (3.6 percent) in the month when the attack is discovered is higher than that of the disclosed attacks (0.7 percent). Kaymiya et al. (2018) document a significant mean cumulative abnormal return of -0.84 percent during the three-day window around cyberattack announcements, which can be translated into an average value loss of USD 495 million per attack.

Lukonga (2018) documents a number of financial institutions that have experienced cyberattacks in the MENA region. As countries become more fintech-oriented, cybersecurity becomes increasingly important, particularly for firms in the financial services sector. This is particularly significant for the wealthy countries in Group 1. However, it is also very important for the countries in Group 2, as illustrated by the hack on the Central Bank of Bangladesh.

9. Regulation of fintech

One of the most important aspects of fintech concerns how its different components should be regulated. The goal has been to design a policy framework that would encourage and support disruptive innovation to enhance financial inclusion and economic growth while simultaneously providing protection to the safety and soundness of the banking system and financial stability overall. Brummer and Yadav (2019) summarize market integrity, rules' simplicity, and financial innovations as the three-legged foundation to accomplish these goals. They point out the trade-offs and potential interplay that could interfere with one another. They

argue that regulation is likely to achieve only two of the three objectives. For example, if regulators prioritize market safety, financial stability, and simple and transparent rulemaking, the rules would likely impose broad prohibitions, which can largely inhibit fintech innovations. Alternatively, if regulators wish to prioritize encouraging fintech innovations and provide clarity of rules, they might have to use a simple and low-intensity regulatory framework that may not ensure safety, soundness, and stability in the financial system. Finally, if regulators look to enable innovations and promote market integrity, they would likely impose a set of more complex rules (and with specific cases of exemptions), which are less transparent and not easy to understand.

With the use of big data and AI/ML, the current wave of fintech has created informational and regulatory gaps and loopholes that need to be closed. Rapid technological advancements have also increased the uncertainty and difficulty in evaluating the impact of new technologies on consumers, the market, and financial systems overall. Jagtiani and John (2018) provide an overview of fintech innovations and regulatory considerations, especially discussions around consumer protection in response to fintech growth. Brummer and Yadav (2019) propose several regulatory strategies in dealing with the potential risks posed by fintech, including informal guidance, no-action letters, regulatory sandboxes, and other pilot programs, as well as licensing versus chartering forms of organization.

A fintech regulatory sandbox is an innovative regulatory method in fintech based on informal guidance. Specifically, it is a mechanism for firms to conduct testing of new fintech products and services in a live environment, with regulatory oversight and subject to certain conditions and safeguards. The innovators are provided with an environment within which they could experiment and try out their new ideas under a more relaxed regulatory environment but without causing harm to the general population or the financial system.

The first fintech regulatory sandbox was proposed and implemented by the UK's Financial Conduct Authority (FCA) in November 2015. The concept was then followed by other countries such as Canada, Malaysia, Singapore, and Australia. The FCA accepted applications for its first three cohorts in June and December 2016 and June 2017. For the three cohorts, the FCA received a total of 146 applications and admitted 68 of them. Nine companies, which had been accepted into the first two cohorts, were unable to test their solutions for a variety of reasons.

The benefits of regulatory sandboxes include not only signalling a friendly general regulatory approach to fintech innovations, but also reducing fintech regulatory uncertainty and increasing regulatory and supervisory capacity. Jagtiani and John (2018) point out how the lack of clarity around which alternative data variables could be used in credit risk modelling has created regulatory uncertainty. The fintech industry seems to be more concerned about fintech regulatory uncertainties and the lack of clarity than regulation itself as they set their strategies and business model. Fintech firms are willing to be regulated in a level playing field with

traditional lenders, for example, as evidenced in several recent applications by a fintech lender to become a bank.

The US regulatory authorities, including the SEC, CFPB, OCC, and FDIC, have also implemented some pilot programs to further understand the various aspects of fintech to consumers and the financial systems. Zetzsche et al. (2017) summarize the current regulatory approaches: doing nothing (being permissive to highly restrictive), case-by-case approach (such as no-action letters in the US), and structured experimentalism (such as sandboxes, testing, and piloting). They propose a new smart regulation approach comprising regulatory design and implementation in stages as follows: testing and piloting environment, conducting a regulatory sandbox, issuing a restricted licensing or a special charter scheme, and finally, when size and income permits, moving to operating under a full license. From each stage to the next, regulatory complexity and costs increase, as does the scope of fintech innovations.

While traditional firms are increasing investments in technology to keep up with the new consumer preferences and sustain themselves in the new tech landscape, tech start-ups and Big Tech firms are rapidly getting involved in payments and providing other financial services. In the long run, traditional financial institutions, fintechs, and Big Techs in financial services – such as Alibaba and Tencent – may converge, as large international banks may buy big data sets from various sources and compile these with their own proprietary data. In addition, some Big Techs may ultimately apply for full financial services licenses and become global financial conglomerates, as evident in the Chinese financial system with Alibaba Big Tech and its subsidiary, Ant Financial, which owns a mutual fund that at one point was the largest in the world.

The opportunities that Big Techs can provide are obvious in reducing transaction costs as well as improving risk management and financial inclusion. From the regulatory point of view, both Big Techs and fintechs seek to minimize regulatory constraints and costs. However, they are still different in terms of clients' trust and potential systemic risks. First, Big Techs create trust in a world unrelated to financial services and leverage clients' trust in the financial sphere. Second, Big Techs are often significant firms prior to stepping into the financial sector, while fintech firms usually start small as problem-driven firms. Hence, a central regulatory issue is the trade-off between improving innovation/financial inclusions and reducing systemic risks.

How the MENA countries regulate fintech will determine the extent to which they are able to take advantage of the fintech revolution and the potential it has for enhancing their growth. This issue is important for both groups of countries. As the example of Kenya shows, even poor countries can make tremendous progress with appropriate innovations. Political economy factors are key in regard to the regulation of Fintech. In many countries, banks lobby hard to prevent the disruption caused by new entrants with different technologies. Governments need to be politically strong to prevent existing financial services firms lobbying for the status quo on various grounds. Given their political and economic structure, MENA countries in both groups need to be particularly wary of this.

10. Concluding Remarks

This section reviews the conclusions of the analysis and the light it sheds on a number of important issues.

What contributions can fintech provide for the economies, financial systems and growth opportunities in the MENA region?

Fintech has many important contributions that it can provide for the countries in Groups 1 and 2. One of the significant problems is expanding financial inclusion, both for households and SMEs. This is a problem for the countries in Group 2 in particular. The experience of Kenya with M-PESA and Equity Bank shows that fintech technology can make significant advances in this area. Steps in this direction will make the financial system and the economy grow as a result. These examples are particularly relevant for Group 2 countries.

Banks play a very important role in the financial systems of all the Group 1 and 2 countries. Advances in credit scoring due to AI and ML and the use of non-traditional information such as Internet footprint will help to improve the efficiency of credit allocation. In Group 1 countries with good access to the Internet, possibilities for improving digital banking will help financial inclusion and improve the ease of banking for most households and SMEs. Finally, P2P platforms will potentially reduce intermediation costs to both lenders and borrowers.

Recent developments in DLTs, blockchains, and cryptocurrencies have made ICOs possible. These have tremendous potential to take the place of traditional venture capital and going public as the route for companies to be founded and grow. The fact that markets for IPOs are international because they take place on the Internet means that the depth of the market is greater than would otherwise be possible. Also, the improved liquidity due to coins being tradeable on cryptocurrency exchanges makes this type of financing attractive to investors. ICOs have great immediate potential for the Group 1 countries and, in the longer run, for Group 2 countries as well.

CBDC's have become increasingly popular with central banks around the world. The results of the pilots in China will be very interesting in showing how they can be implemented in practice. Since the oil suppliers in Group 1 have extensive business with China, and given the Chinese government's desire to internationalize the yuan, this is an area their central banks can benefit from investigating.

One of the major weaknesses of fintech is its vulnerability to hacking and cyber-attacks. To the extent to which they develop significant fintech capabilities, countries in both groups will need to implement significant cybersecurity protections.

Finally, a critical aspect of allowing fintech to flourish and develop is how it is regulated. Kenya provides one example of this. Their thoughtful regulatory approach allowed innovations such as M-PESA and Equity Bank to be introduced and thrive. The UK's regulatory sandbox approach also provides an example of how allowing innovation can lead to significant leaps forward for fintech and, as a result, the overall economy.

What effects will the development of fintech have on inequality in the various countries?

Fintech has the potential to lessen inequality in all of the countries that are the focus of this paper. Financial inclusion based on the technology of M-PESA and Equity Bank can improve the opportunities of the poor considerably. This is not only in terms of personal access to finance, but also the access of SMEs to funds. Similarly, ICOs and the prospect of firms being founded and growing as a result also represent a large step forward.

How should policymakers in the MENA region deal with fintech innovations?

In general, policymakers have been resistant to fintech. Countries that have been more permissive such as Singapore, Switzerland, and the UK have already benefitted significantly from the innovations that fintech has led to; they provide an example to MENA countries about how to benefit from fintech. The role of fintech in helping MENA countries prosper and grow is at an early stage. However, the revolution these technologies can bring about can help transform these countries and their populations significantly.

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Table 1. Data for selected MENA countries

Country	2019 PPP GDP per Capita International $	2015 Bank Deposits to GDP %	2015 Bank Credit to Bank Deposits %	2015 Stock Market Capitalization to GDP %	2015 Stock Market Total Value Traded to GDP %	2020 World Bank Ranking for Ease of Doing Business
Group 1						
Bahrain	47,003	81	89	67	2	43
Kuwait	52,060	95	100	57[a]	12[a]	83
Oman	28,508	49	125	57	7	68
Qatar	94,029	85	76	102	25	77
Saudi Arabia	49,040	40	134	69	77	62
UAE	70,089	85	90	59	28	16
Group 2						
Algeria	12,020	51	40	0	0	157
Egypt	12,284	60	41	19	6	114
Iraq	11,363	25	35	0	0	172
Jordan	10,517	96	71	67	8	75
Lebanon	15,196	233	40	23	19	143
Morocco	7,826	87	74	45	3	53
Tunisia	11,232	55	133	19	1[b]	78

Sources: World Bank.
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[a] Figures for 2012. [b] Figure for 2014.